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ABSTRACT

The position behind this study is that the college faculty member can improve his teaching, even if he is already a master teacher, by scientifically identifying some of the key variables that have a major impact on student learning in his classes. Two studies have attempted to answer the following question: Is there any evidence that a college student's personality is related to his preference for various instructional experiences? Jungian personality types were used. The first study found that the students tested held predictable views for and against self-paced instruction: intuitive students preferred self-paced instruction to more traditional group-paced teaching methods; sensing types liked more traditional methods of instruction. The present study sought to find if associations made in the first study still held up and to determine what relationships, if any, existed between student types and each of the self-paced course modules. The instrument of study was a five-credit, self-paced course of 54 students in thermodynamics. It consisted of 20 self-paced instructional modules (packages). Three types of data-gathering instruments were employed: (a) a course evaluation form, (b) a module evaluation form, and (c) the Myers-Briggs Type Indicator which measures the differences in student personality and learning types. (Findings, conclusions, a summary, and recommendations are presented for this study.) (JA)

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PERSONALITY VARIABLES AND THE IMPROVEMENT OF COLLEGE TEACHING

by

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The debate as to whether or not college teaching is an art or a science has raged for hundreds of years on college campuses. Some faculty take the position that "great teachers" are born not made. Others, while admitting that teaching is an art, argue that one can always perfect one's art by approaching it in a more scientific fashion. This latter group, the group with which we side, maintains that teaching is both an art and a science. It is our position that the college faculty member can improve his teaching even if he is already a master teacher by scientifically identifying some of the key variables that have a major impact on student learning in his classes.

STATEMENT OF THE PROBLEM

A few years ago we set out to determine the answer to the following question: "Is there any evidence that a college student's personality is related to his preferences for various instructional experiences?" The method we chose was the typology of C.J. Jung based on differences in the way a person perceives and the way he judges.[1] Research already existed showing that Jungian personality types, as measured by the Myers-Briggs Type Indicator, differ in how various academic disciplines attract them and their performance in various academic fields.[2] More important, types differ in academic motivation, aptitude, and achievement and most importantly there appears to be differences in the way different Myers-Briggs types learn. In summary, we felt that the Myers-Briggs Type Indicator (MBTI) was one of the best instruments we had for measuring student learning styles.

In the past few years, as the faculty of the University of Florida has worked more intensively with type, teachers have reported differences among students in response to review sessions, in choice of voluntary assignments,

and in reading difficulties--and these differences were consistent with the student's personality type. In our first research project, conducted in the Spring of 1972 in a self-paced thermodynamics course consisting of 58 students, we found that different types of junior and senior engineering students held predictable views for and against self-paced instruction. Intuitive students preferred self-paced instruction to more traditional group-paced teaching methods. Sensing types liked more tradtional methods of instruction. Sensing types in our 1972 study felt that individualized or self-paced instruction was dehumanizing and impersonal and they did not feel that they did their best work in courses where they were left to work by themselves. Intuitives, on the other hand, tended to enjoy self-paced instruction and felt that they did their best work when they worked independently of others.[3]

It appeared to us after our first study that a major advance could be made rapidly in college teaching by intensively studying the learning styles of students of different MBTI styles. We felt that if we could demonstrate differences in approaches to self-paced instruction, we could have hypotheses for improving alternative learning experiences within a self-paced instructional system and for ways to fit college teaching to individual learning styles.

In our second research project, we were most interested in seeing if the associations in our first research project held up again and in determining what relationships, if any, existed between student types and each of the self-paced, thermodynamics course modules. We were particularly interested in finding out whether or not the cognitive styles of Sensing and Intuition were associated with such variables as the (1) total time spent on a course module (2) number of quizzes taken for a module (3) module difficulty (4) value of a

module in terms of amount learned (5) the importance of a module's objectives to training (6) enjoyability of a module (7) clarity of presentation in a module and (8) overall module rating. We felt that we had learned enough from our first study about the sensing and intuitive dimensions of type to be able to predict which of the course's modules Sensing types would prefer and which one's Intuitive types would rate highly.

METHODOLOGY

The instrument of study was a five credit self-paced course of 54 students in thermodynamics taught in the Spring of 1973 by Irey. It consisted of 20 self-paced instructional modules (packages). Each module listed its behavioral objectives and directed the student to appropriate learning activities. All of the units were in written form, and all units had both lecture and help session options. For each unit, except units IA, IIIA, and IIIB, students were required to take and pass a written quiz before moving on to the next unit of material. Audio tapes of instructor lectures or discussions accompanied all but the following modules: IA, IIA, IIC, VA, VB, and VC.

More specifically activities for the course included:

1. Unit Text. A modular text written for use with the course. It presented the material and included examples and self-assessment exercises.

2. References. Each module listed those portions of texts, problem texts, and programmed texts appropriate for its objectives. The texts were available on study tables in a learning laboratory.

3. Lecture--Discussion Sessions. Students were given a weekly schedule of daily class sessions. Each session was devoted to one module. The schedule skipped around and repeated itself to facilitate different student rates of progress.

4. Help Sessions. Interspersed with the lectures were problem sessions

conducted by the instructor (about 2 problem sessions for every lecture).

5. Audio-Tape Cassette Lectures. A 30 to 60 minute cassette-lecture was made available for 15 of the modules. Students copied a master cassette on their own cassette with a high speed duplicator. The tapes could be used in the learning laboratory or elsewhere.

6. Individual Help. Students were encouraged to work in the learning laboratory on the modules. Students used one another, the monitors and the instructor for individual help in the course.

Each module was tested with a pass/fail proficiency exam (most were written problems but a few were oral). All tests were administered by peer-teachers (monitors), who selected the individual's questions randomly from the appropriate file. The monitors graded the proficiency exams and provided immediate oral feedback, and specific recommendations to correct learning deficiencies as appropriate. In addition to the proficiency exams, the students were required to complete four assimilative exams requiring proficiency on combined objectives. Previous research had shown that students were achieving at a much higher level of proficiency in this course than under an old lecture-paced format.

Listed below are the names of the course's 20 modules. At the end of each course title is an S or an N. These symbols indicate the predictions we made for each of the modules before we began our research. In other words, we tried to predict which modules in the course would be preferred by the Sensing (S) type students and which ones would be preferred by the Intuitive (I) type students.

Unit IA - Introduction to and Definitions in Thermodynamics (N)
Unit ISI - Dimensions, Units, Exponentials and Logarithms (S)
Unit IB - The First Law, Energy and Work (N)
Unit IC - Properties of Pure Substances In and Near Multiphase Regions (S or N)
Unit ID - Properties of Single Phase Substances (N)
Unit IIA - Closed System First Law Analysis (N)

Unit IIB - First Law Analysis of Open Systems (N)
Unit IIIA - Equilibrium--A Microscopic Understanding (N)
Unit IIIB - Entropy, Equilibrium Distributions and the Second Law of Thermodynamics (N)
Unit IIIC - Calculation of the Properties of Perfect Gases (N)
Unit IIID - Applications of Statistical Mechanics to Bose and Fermi Particles (N)
Unit IIIE - Transport Properties (N)
Unit IVA - Thermal Engines and Reversibility (S or N)
Unit IVB - Second Law Analysis of Open and Closed Systems (N)
Unit IVC - Generalized Equations for Thermodynamic Properties (N)
Unit IVD - Gas Tables (S)
Unit IVE - Calculation of the Measurable Properties of Real Gases by Generalized Charts (S)
Unit VA - Gas Power Cycles (S)
Unit VB - Vapor Power Cycles (S)
Unit VC - Refrigeration and Gas Liquefaction (S)

As you can see we were uncertain of the classification of some of the units. These units contained learning activities which we felt would appeal to the cognitive styles of both Sensing and Intuitive type students. The guidelines we used for classifying each unit came from Myers' (1970) description of the effects of each type preference in work situations.[4] Myers descriptions are outlined here.

EFFECTS OF EACH PREFERENCE IN WORK SITUATIONS

INTUITIVES	SENSING TYPES
Like solving new problems.	Dislike new problems unless there are standard ways to solve them.
Dislike doing the same thing over and over again.	Like an established routine.
Enjoy learning a new skill more than using it.	Enjoy using skills already learned more than learning new ones.
Work in bursts of energy powered by enthusiasm, with slack periods in between.	Work more steadily, with realistic idea of how long it will take.
Frequently jump to conclusions.	Must usually work all the way through to reach a conclusion.
Are patient with complicated situations.	Are impatient when the details get complicated.
Are impatient with routine details.	Are patient with routine details.

Follow their inspirations, good or bad.	Rarely trust inspirations, and don't usually get inspired.
Often tend to make errors of fact.	Seldom make errors of fact.
Dislike taking time for precision.	Tend to be good at precise work.

We were predicting that our correlation data would show that there was a tendency for Sensing (S) type students to prefer six of the course's 20 units with Intuitive type students giving higher ratings to 12 units. On two units we were undecided as to which type would rate the units' learning experiences at a higher level.

Three types of data gathering instruments were employed in this investigation. An overall course evaluation form was developed to collect both factual and attitudinal data on the course. Students were asked to complete this form when they finished the course. This instrument was used to collect data in the following areas: (1) general student background information (2) nature of student learning activities (3) student evaluations of individual sections of the course and (4) student attitudes relative to self-paced instruction. A module evaluation form was also developed to collect evaluative and factual data on each of the course's 20 modules. On this form students were asked to describe (1) how they spent their time in working through the module and (2) how many quizzes they took to pass the module. They were also asked to rate the (1) level of difficulty (2) amount learned (3) importance of objectives to training (4) enjoyability (5) clarity of presentation and (6) overall value of each module using this form. Finally, the Myers-Briggs Type Indicator was selected to measure the differences in student personality types and learning styles. These instruments were completed by 54 of the students for a response rate of 100 percent.

The Myers-Briggs Type Indicator (MBTI) is a 166-item self-administering questionnaire published in 1962 by the Educational Testing Service after 20 years of development. The MBTI was designed to implement Jung's theory of psychological types which assumes that "much apparently random variation in human behavior is actually quite orderly and consistent, being due to certain basic differences in the way people prefer to use perception and judgment." Four pairs of preferences are scored to arrive at a subject's type:

> Extraversion (E)--Introversion (I): The Direction of Interest.
> Does the subject's interest flow mainly to the outer world of actions, objects, and persons (E) or to the inner world of concepts and ideas (I)?
>
> Sensing (S)--Intuition (N): Perception.
> Does the subject attach more importance to the immediate realities of direct experience (S) or to the inferred meanings, relationships, and possibilities of experience (N)?
>
> Thinking (T)--Feeling (F): Judgment.
> In making judgments, does the subject rely more on logical order and cause and effect (T) or on priorities based on personal importance and values (F)?
>
> Judging (J)--Perception (P): Life Style:
> Does the subject prefer to live in the judging attitude systematically, planfully, deciding what needs to be done and attempting to control events (J) or in the perceptive attitude, spontaneously, curiously, awaiting events and adapting to them (P)?

Notice that this type indicator measures the ways people become aware of things--by sensing and intuition; and the ways people judge things--by thinking and feeling. It is our contention that a college student learns most naturally out of the kind of perception and kind of judgment he prefers. If this is correct, then the most eff ective college teaching will be that which matches teaching methods to the student's preferred mode of perceiving and judging.

In order to systematize the large number of variables investigated in our research, a simple Pearsonian product-moment correlation analysis was

conducted to determine the strength and directions of the relationships between the four preferences (EI, SN, TF, and JP) and 308 selected research variables. Following the conventional practice, the preference score on the Myers-Briggs was converted to a continous score where 100 marked the division point, and scores below 100 represented preferences for E (extraverted), S (sensing), T (thinking), or J (judging), while scores over 100 represented preferences for I (introverted), N (intuitive), F (feeling), or P (perceiving). The findings listed and described in the remaining sections emphasize those correlation coefficients that were statistically significant at the .05 level of significance (.05 corresponds to a chance possibility of occurence of 5 percent). We also identify correlation coefficients that were significant at the .20 level or below to further support our predictions regarding the directions variable relationships.

Our first test for determining whether or not we had accurately predicted the Intuitive (I) and Sensing (S) type students' ratings of 18 of the courses' modules was the Z test for testing an observed proportion against the null value of .50. Since we were unable to predict whether Intuitive or Sensing type students would favor Units IC and IVA, these units and the correlation coefficients associated with them were not included in our analysis. We were interested in seeing whether or not we could predict accurately the direction of the 108 correlations associated with the students'ratings of the remaining 18 modules. (Six correlation coefficients were calculated for each of the 18 modules for which definite predictions were made). We felt that a statistically significant proportion of correlation coefficients in the predicted directions would support our major hypothesis that student type is related to student ratings of curriculum and instructional experiences. Our second test for

determining the accuracy of our predictions for 18 of the modules consisted of using the binomial distribution to test our predictions. The probability of getting 6 out of 6 (or 0 out of 6) correlations in the predicted direction for any one module was .032. This was the second criteria that we applied to determine the accuracy of 18 of our predictions.[5]

FINDINGS AND CONCLUSIONS

In this section I will briefly discuss our findings for some of the 20 units, reporting the direction and strength of relationships between the Sensing-Intuition dimension of the Myers-Briggs Type Indicator and eight variables identified on the students' evaluation forms for each of the 20 modules.

Table I data suggests that there was a tendency for Intuitive type students to express a greater preference for Unit IA than Sensing type students. While there were no statistically significant correlation coefficients at the .05 level, the direction of the correlations reported in Table I suggest that N types were associated with more favorable views of this unit than S types. Intuitive types were associated with higher ratings of the module's objectives, clarity, and overall value than Sensing types. Sensing types on the other hand seemed to have more trouble passing the unit's quizzes. We were most interested in the direction and strength of the correlation coefficients for variables 3-8. These were the 6 variables for each unit that represented the students' rating of the instruction he received in the unit. In Table I we can see that 5 out of the 6 correlation coefficients for these variables and the SN dimension of the type data were in the predicted direction. In 5 out of 6 cases Intuition was associated with higher ratings of the module than Sensing. This particular finding failed to meet the second statistical test criteria that we

had established for the acceptance or rejection of our 18 predictions, but it did provide overall support for our major hypothesis that student type is related to student curriculum and instructional experiences.

TABLE I
Correlations or SN Data With Module IA
Evaluation and Feedback Data

Type Variable	Module Feedback and Evaluation Variables[1]							
	1	2	3	4	5	6	7	8
SN[2]	+.04	-.23	-.05	+.12	+.26	+.18	+.24	+.24
		(.12)[3]			(.08)		(.10)	(.10)

[1] The variables studied in this part of our research were as follows:
1 = Total time in hours that it took a student to complete the unit.
2 = Number of quizzes taken before the unit was passed.
3 = Level of module difficulty compared to other modules (1-20).
4 = Amount learned (1-20) compared to other modules.
5 = Importance of module's objectives to training compared to other modules (1-20).
6 = Enjoyability of module compared to other modules (1-20).
7 = Clarity of presentation in module compared to other modules (1-20).
8 = Overall rating of the module compared to other modules (1-20).

[2] The symbols represent the personality types Sensing-Intuition (SN). The type scores were correlated with the evaluation and feedback data on each module to arrive at the correlation coefficients shown in this table.

[3] The data in parentheses represents the statistical level of significance of each of the correlation coefficients. The negative sign in front of .23 indicates an inverse association e.g., -.23 opposite the SN row shows that Sensing (S) type students demonstrated a tendency to take more quizzes on the average in Unit IA than Intuitive (N) type students.

Data for the last three units of the course showed that our predictions held fairly well for all three units. While the strength of the correlations were not always as high as we would have liked them to be, they were for the most part in the anticipated directions. Table II shows

the correlation coefficients for the course's Units VA, VB, and VC.

TABLE II
Correlations of SN Data With Module VA, VB and VC Evaluation and Feedback Data

Type Variable	Module Feedback and Evaluation Variables							
	1	2	3	4	5	6	7	8
SN_{VA}	-.25	+.00	-.03	-.24	-.38 (.13)	-.62 (.01)	-.49 (.05)	-.45 (.07)
SN_{VB}	-.08	+.03	+.15	-.13	-.03	-.11	-.39 (.11)	-.29
SN_{VC}	-.09	-.11	+.32 (.17)	-.38 (.10)	-.48 (.13)	-.58 (.01)	-.46 (.04)	-.46 (.04)

We predicted that all three of these units would be enjoyed and rated higher by Sensing (S) type students because thay all require detail work and practical application. The kind of work that appeals to Sensing Types and not Intuitives. For variables 3-8 in all but two cases our predictions were correct. Irey, who is an INTJ (Introvert-Intuitive-Thinking-Judging) type, the designer of the course's modules classified these units as boring. As an Intuitive type, he now understands why his Sensing type students enjoy these units.

Time does not permit me to show you all of the correlation data that we collected on each of the courses 20 modules. On four of the 20 modules we correctly predicted the direction of the correlation coefficients for variables 3-8. On another 7 modules we correctly predicted the direction of 5 of the 6 correlation coefficients on the same 6 student rating variables. Using our second criterion test then for the acceptance or rejection of our predictions, we can say that four of our twenty predictions

were fully upheld and another seven predictions were partially supported.

We correctly predicted, in our study, the direction of 82 of 108 correlation coefficients over 18 modules. In other words, we correctly predicted the direction of 76 percent of the correlation coefficients examined for support of 18 of our predictions. Employing the formula,

$$Z = \frac{p - .60}{\sqrt{\frac{P_0 q_0}{n}}}$$

which is the formula for determining Z in the Z test for testing proportions against the null hypothesis, we obtained a value for Z of 5.64. The fact that this Z value is statistically significant at the .01 level suggests that our major research hypothesis was supported, i.e., student type appears to be associated with student ratings of curriculum and instructional experiences.

Based on these findings we believe that a number of conclusions can be drawn from this part of our research:

1. It would appear that a science of teaching is possible. Knowledge of a student's preferences for receiving information (his cognitive style) can be used to predict his reactions to various teaching models or instructional strategies or vice versa.

2. Knowledge of a student's personality type or learning style as measured by the Myers-Briggs Type Indicator can be useful information for college teachers in designing more effective college instruction. Such information can be used to provide a variety of learning options for Sensing and Intuitive type students, thus enhancing the chances for desired learning outcomes. (Frey has made a conscious effort as a result of this study to meet more fully the needs of the unusually high number of Sensing types found quarter after quarter in his thermodynamics course.)

3. Findings of the study are consistent with theory. Sensing types apparently do dislike new or abstract problems unless there are standard ways to solve them. They also seem to prefer established routine, are patient with learning activities that focus on detail, and do well at

precise work. Intuitive type students seem to like solving new problems, problems that focus on the world of ideas. They dislike repetition and grow impatient with college teaching that focuses on routine details or that requires alot of precision.

4. It appears that personality type data can be used by college teachers to enhance their student ratings. There was a tendency in this study on the part of students to rate more highly those learning and teaching experiences which matched the students' learning styles.

5. A science of teaching is possible. College teachers can enhance student growth by designing learning options that will motivate students to learn. It is possible in advance of a course, at least in the area of thermodynamics, to be able to know which type of instruction will excite particular types of students.

6. Self-paced instruction is likely to be more effective if the variety of student personality types (learning styles) are taken into consideration when curriculum and instruction is planned. The self-paced course that favors only the cognitive style of the intuitive type student is likely to fail to meet the needs of many students.

In our attempt to develop a more scientific approach to college teaching, we looked first at the relationships between personality type and student assessment of their instructional experiences. We would now like to report the associatons we discovered between personality type variables as measured by the Myers-Briggs Type Indicator and a host of other variables commonly associated with the teaching-learning process. Many of the associations or findings reported here are consistent with the theory upon which the MBTI is based. The findings reported here are also consistent in many cases with our research in the Spring of 1972 on college student personalities and self-paced instruction. All of which makes us more confident that a science of college teaching is possible at the college level.

Personality Types and General Student Background Information

TABLE III
Correlations of Personality Type Data With
General Student Background Information*

Background Variables	EI	SN	TF	JP
1		-.31		
2				-.38
4				-.30
5		+.26		
6				-.35

* All correlation coefficients shown were significant at the .05 level or beyond.

Variable 1 was the student's engineering major in Table III. As expected we found there was a greater tendency for Civil Engineering and Industrial Systems Engineering students to be Sensing as opposed to Intuitive type students. This type of information is particularly useful since the course instructor can now develop alternative learning activities to fit the particular learning styles of these two majors. This should offset some of the negative feelings that Sensing type students expressed in our 1972 research toward self-paced instruction that was developed primarily for intuitive type students by an intuitive type instructor.

Variable 2 in Table III was the student's grade point average. The correlation coefficient of -.38 indicates that the Judging trait was associated with higher, upper division grade point averages. This finding was consistent with previous research which has shown that college teachers favor the Judging type student because he is often more organized, efficient,

and more thorough than the Perceiving type student. (In our own previous research we had found Introversion to be associated with higher grade point averages.)

Variable 4 represents the number of quarter hours students were carrying while taking Irey's self-paced course. The statistically significant correlation coefficient of -.30 suggests that there was a tendency for the trait of Judging to be associated with larger student course loads. This is not an unexpected finding since we found Perceiving types in our first study to be procrastinators who had difficulty meeting course deadlines. One would expect Judging types to carry larger course loads because of their ability to plan and complete tasks on schedule. (Our previous research with students in this self-paced course had demonstrated that Thinking was associated with higher course loads.)

Variable 5 was the number of previous self-paced college or high school courses that our sample students had taken. In our first research project (1972) we found that intuition (N) was associated with a preference for self-paced as opposed to group-paced instruction. The positive correlation coefficient of .26 adds additional validity to this earlier finding. There was a tendency for intuitive types to have taken a higher number of self-paced instruction courses prior to Irey's course. (In our first research project we also found that Perceiving (P) was associated with a preference for self-paced instruction over more traditional methodologies such as lecture courses.)

Variable 6 was a measure of whether or not this was the first registration of the student in the course. Our previous research had shown us that Intuition and Perception were associated with later course completion

dates but we had not attempted to determine whether or not there was a greater tendency for a particular type of student to drop out of the self-paced course on a regular basis. The correlation coefficient of -.35 suggests that Judging was associated with second registrations in Irey's course. We have no explanation for this; we had expected the Perceiving types to be the ones who had to enroll a second time to complete the course.

Personality Type and Student Learning Activities

Table IV shows the associations we discovered between type data and student descriptions of their learning activities in the course.

TABLE IV
Correlations of Personality Type Data With
Student Descriptions of Their Learning Activities

Learning Activities	EI	SN	TF	JP
11	+.29			
12	-.32			
14	-.31			
15	-.31			
16	-.29			

Variable 11 was the total number of classroom lecture sessions attended by the student. The statistically significant correlation of +.29 suggested that there was a greater tendency for Introverted as opposed to Extraverted students to attend the instructor's supplementary lecture sessions for each of the courses' units. This may possibly be explained by the Introverts' interest in the inner world of ideas and preference for

situations where he can reflect at length before taking action. The Extravert may have stayed away from the course lecture sessions because of his preference for action and communication with other people. At least this is our explanation for this finding. We believe that some of the other correlations found in this section support this hypothesis because they suggest that Extraverts preferred aspects of the course where they had a chance to communicate and work with other people. (Judging was associated with a preference for the lecture mode in our 1972 research.)

Variable 12 was the total number of times the student used course reference supplements for all of the 20 modules or course units. As you can see from the -.32 correlation, Extraversion was associated with more frequent use of unit reference supplements. We feel that this association can be explained by the Extravert's gregarious nature, his tendency to reach out for materials other than lectures. It is possible that the Extravert tends to view the lecturing process as being too slow and tedious for his fast-paced life style that focuses on getting a job done. For the Extravert the reading of course supplements is probably viewed as the fastest way to complete a course unit.

Variable 14 was the total percentage of time the student spent on the courses' 20 progress quizzes plus 4 exams as compared to other activities in the course. The association of Extraversion with higher percentages here, as indicated by the -.31 correlation coefficient, was not a particularly surprising finding. Previous research with the Myers-Briggs Type Indicator has shown that Introverted students and faculty far outnumber Extraverts in the college community, particularly in colleges of engineering. The ratio is usually 3 to 1. We expected Extraverts to take more quizzes and to spend more time on individual quizzes because of the

Extravert's dislike for complicated procedures and tendency to act quickly, sometimes without thinking in problem situations. Another variable that may have been operating here was the fact that the course instructor was an Introverted-Intuitive type. His exams no doubt favored the Introverted type by stressing understanding and application of very abstract concepts and ideas as opposed to the memorization of standard procedures or simple rules.

Variable 15 was a measure of student opinion as to whether or not the course's progress quizzes were effective in verifying mastery of each module's content or objectives. The -.31 correlation coefficient shows that Extraversion was associated with the feeling that progress quizzes fulfilled their purposes. We offer two possible explanations for this phenomenon (1) it may be that Extraverts enjoyed the quizzes because they had a chance to extravert, interact with the course monitors and (2) the immediate personal grading may be very attractive to the Extravert as opposed to the more introverted student who usually has some problems communicating his ideas orally.

Variable 16 measured student views as to whether or not progress quizzes were effective in developing mastery of unit content and objectives. Again from the correlation coefficient of -.29, we see Extraversion associated with the view that the quizzes were effective. The same reasons for this possible relationship that were given for Variable 15 apply here.

Time does not permit me to show you all of our research findings. I would, however, like to close by summarizing a few other major findings.

1. Judging types felt in our research that grades become meaningless when over one-half of a group of students gets A's. This is probably a reflection of the Judging types need to reach

judgements on things, situations or persons.

2. Sensing types tended to feel that people who goofed off and took more than a quarter to complete this course should fail or receive a low grade. It may be that the Sensing type cannot stand people who are not as methodical as they are. (In our first research we found that Sensing and Judging traits were associated with earlier course completion dates.)

3. In our research project in 1972 we found that Sensing and Perception traits were associated with the view that self-paced instruction is dehumanizing and impersonal. That association did not hold up in this second research project. In our first research project, however, we did find that Judging was associated with a preference for traditional methods of instruction and the preference for lecture courses to all other forms of instruction. In this research project, Judging was associated with the view that self-paced instruction is dehumanizing and impersonal. In terms of the Judging dimension then our research appears to be consistent with our previous research.

4. In our 1972 research project, Introversion was associated with higher ratings for the courses' 9 monitors. In this study Perception was associated with the view that the monitors were very helpful. Perceiving types may have held this view because the monitors kept them from procrastinating, gave them needed structure, and motivated them to meet deadlines and get their work done.

5. Finally, we again found that Perception was associated with later course completion dates. In our first study we had found that both Perception and Intuition were associated with later course completion dates.

SUMMARY AND RECOMMENDATIONS

The above findings have shown once again that personality traits influence both student attitude and performance in our sample, self-paced course. It is clear that the individualization of instruction and variety of instructional strategies available within a self-paced course are desirable and should be continued or expanded. A major weakness in college teaching appears to lie in the teacher's and student's lack of recognition of each other's preferences and needs for different learning activities. The

Intuitive-Thinking (NT) instructor, who likes to solve new problems and put things into a logical order, may not design very effective instruction for his Sensing-Feeling (SF) students, who dislike new problems unless there are standard ways to solve them, and who also value human likes and dislikes above logic. It would appear that self-paced instruction will be even more effective if methods can be found to design modules or instructional packages which fit different styles of student perception and judgement. In this study the instructor himself gained from understanding his own personality type (INTJ) in relationship to those of his students. For this reason, we recommend that future projects examining the influence of type on learning obtain data on both the instructor and his students.

Even in this small sample, findings were not only statistically significant, but they were in the direction suggested by theory. It looks as if further investigations of the relationships between student types and learning styles would be worthwhile. Possible next steps could include studies with larger samples of students from within and outside of engineering courses, including self-paced modules specifically designed to be effective with certain student types, and testing these out on all personality types. Also, studies that look more closely at type differences versus different aspects of achievement, attitudes, and motivation should be conducted. Finally, studies relating course evaluations to student and teacher types could prove valuable.

From this study it would appear that relationships between personality types and student learning styles and attitudes may exist. It is hoped that continuations of this research at the University of Florida and elsewhere will provide more complete answers to our original question: "How is a

college student's personality type related to his preferences for various instructional strategies, his learning traits, and his evaluations of various instructional experiences?"

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